**Unit 9 Notes: Organism Form and Function (Maintaining Homeostasis and Responding to Stimuli)**

***Part C: Cellular Communication***

Ms. Ottolini, AP Biology, 2012-2013

***Directions:*** *Use the links provided on the Wiki page to access each video. Answer the questions below thoroughly and accurately. You do not need to answer in complete sentences, however, please remember that a complete thought often requires a complete sentence! You may need to record your answers on a separate piece of paper.*

**Video #8: Bozeman Biology – Cell Communication**

1. According to Mr. Anderson, what are the three types of cell communication (see concept map)?
2. What is the advantage of using long-distance communication? Why does Mr. Anderson compare this type of communication to a Facebook status post?
3. ***Cell-Cell Direct Contact:*** Explain how an Antigen Presenting Cell communicates directly with a helper T cell. Make sure to discuss MHC2 (Major Histocompatibility Complex 2) and CH4 in your answer.
4. ***Cell-Cell Direct Contact:*** How does a helper T cell respond to communication with an APC cell?
5. ***Short Distance Communication (using local regulators):*** Explain how neurotransmitters are used for communication between neurons (nerve cells).
6. ***Short Distance Communication (using local regulators):*** Describe the function of B-endorphin, a neurotransmitter. How are drugs like morphine and heroin related to B-endorphin?
7. ***Long Distance Communication:*** Describe several ways in which Human Growth Hormone (secreted by the brain’s pituitary gland) affects the body.

**Video #9: Bozeman Biology – Signal Transduction Pathways**

*\*\*\*Note: In our Cell Division and Signaling Unit (Unit #4), we discussed the three parts of cell signaling – Reception, Transduction, and Response. Looking back to your notes from Unit #4 may help you to better understand the content presented in this video. Here, Mr. Anderson gives you a real-life example of signal transduction in the human body\*\*\**

1. What is a ligand? Which ligand is Mr. Anderson using as an example in this video?
2. Describe the role of the G protein receptor in this particular cell signaling pathway. Make sure to mention the alpha subunit!
3. Explain the role of the enzyme adenylyl cyclase in the creation of the second messenger molecule cyclic AMP (cAMP).
4. How does cyclic AMP affect protein kinase molecules?
5. How do protein kinase molecules activate target enzymes within the cell?
6. What is the target enzyme in this example? What affect does this enzyme have on liver glycogen?
7. How does the message from ephinephrine get “amplified” in this pathway?
8. The epinephrine (aka adrenaline) hormone is the signal that triggers the “fight or flight” response. Sooo, let’s say you see a big ole’ grizzly bear in the woods. This triggers the release of epinephrine from the adrenal glands, which sit on top of your kidneys. Epinephrine is recognized by G protein receptors on liver cells, which causes the cell to respond by breaking down glycogen and releasing glucose into the blood stream. How does increased blood glucose help you to run away from the bear?
9. Draw a picture summarizing the epinephrine and liver cell signaling pathway in the box given below. Label the following molecules and steps in the process:

***Molecules:*** Epinephrine ligand, G protein, alpha subunit, adenylyl cyclase, ATP, cAMP, protein kinase, phosphorylase, glycogen, glucose

***Steps:*** Reception, Transduction (including phosphorylation), Response

**Video #10: Bozeman Biology – Effects of Changes in Pathways**

1. What effect does the toxin produced by Anthrax bacteria have on the adenylyl cyclase enzyme? Why does this have so many effects on the body?
2. Describe a normal insulin and liver cell signaling pathway. Make sure to mention the insulin receptor and glucose transporter in the membrane of the liver cell.
3. How does Diabetes Type 1 affect the insulin and liver cell signaling pathway? *(Yes, I realize this is review!)*
4. How does Diabetes Type 2 affect the insulin and liver cell signaling pathway? *(Yes, I realize this is review!)*

**Video #11: Bozeman Biology – Evolutionary Significance of Cell Communication**

1. How are the goals of cell communication different in unicellular organisms vs. multicellular organisms (see concept map)?
2. How do the actual molecules and processes involved in the signaling pathways (not the goals of the pathways) compare between unicellular and multicellular organisms?

1. What is quorum sensing in bacteria? Describe the role of autoinducer proteins in quorum sensing.
2. Compare quorum sensing in bacteria to the mechanism of the fight or flight response in multicellular organisms (ex: humans!).